



Creative Circuitry (Workshop)

Dr. AnnMarie Thomas, University of St. Thomas

AnnMarie Thomas is a professor in the School of Engineering at the University of St. Thomas where she is the director of the UST Center for Engineering Education. Her research group, the Playful Learning Lab, focuses on engineering and design education for learners of all ages.

Emma Koller, University of St. Thomas

Emma Koller is an undergraduate at the University of St. Thomas where she is majoring in Electrical Engineering. She is a research student in the Playful Learning Lab.

WORKSHOP PROPOSAL FORM

2015 Annual ASEE K-12 Workshop on Engineering Education
“Authentic Engineering: Representing & Emphasizing the E in STEM”
Presented by Dassault Systems

Saturday, June 13, 2015
8:00 A.M. – 5:00 P.M.
Sheraton Seattle | Seattle | WA

Please complete this form, save it as a PDF file *only* and upload it through the ASEE Paper Management system as shown in the K12 Workshop Presenter’s Kit.

All notifications will be by email from the ASEE Paper Management system.

NOTE: To ensure that emails are not obstructed by spam blockers, please make sure to WHITELIST the email addresses: monolith@asee.org and conferences@asee.org and s.harrington-hurd@asee.org.

Direct questions to Stephanie Harrington-Hurd, ASEE K-12 Activities Manager, at s.harrington-hurd@asee.org. Additional workshop details are available at: <http://www.asee.org/K12Workshop>. Thank you!

Deadline

Friday, January 23, 2015 by 5:00PM EST

Presenters will be notified of acceptance status by March 14.

Late submissions will not be accepted.

Advanced Workshop Registration will open December 6, 2013.

SUBMISSION INFORMATION

Provide the first and last name of each presenter, including affiliations. If there is more than one presenter, designate one person as the organizer and provide only that person’s contact information. The organizer is responsible for communicating to co-presenters.

Number of Presenters: 3

Presenter Name(s):

- 1) Koller Emma University of St. Thomas
- 2) Van Beek Lauren University of St. Thomas
- 3) Thomas AnnMarie University of St. Thomas

Contact Person’s Name: AnnMarie Thomas

Contact Person’s Email: apthomas@stthomas.edu

Contact Person’s Phone: 651-263-9979

Contact Person’s Alternate Phone: 651-797-3087

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- 1) Emma Koller is an undergraduate at the University of St. Thomas where she is majoring in Electrical Engineering. She is a research student in the Playful Learning Lab.
- 2) Lauren Van Beek is an undergraduate at the University of St. Thomas where she is majoring in Mechanical Engineering. She is a research student in the Playful Learning Lab.
- 3) AnnMarie Thomas is a professor in the School of Engineering at the University of St. Thomas where she is the director of the UST Center for Engineering Education. Her research group, the Playful Learning Lab, focuses on engineering and design education for learners of all ages.

WORKSHOP INFORMATION

Proposed Title: Creative Circuitry

Abstract:

This workshop will be a hands-on introduction to “Creative Circuitry.” Participants will learn about craft and art projects which incorporate electrical circuits. Special emphasis will be placed on using these projects and methods in programs for children from diverse backgrounds and abilities. We will discuss techniques and strategies for incorporating Creative Circuitry into a variety of different educational contexts. The session will also include an introduction to basic electronics and circuit components.

Workshop Description.

This workshop explores “Creative Circuitry,” which we define as teaching elementary electrical circuit design and construction through projects where technology is embedded in craft. The presenters of this workshop, and their colleagues, have led Creative Circuitry explorations in a wide variety of settings for audiences ranging from PK-elementary classrooms, summer workshops for girls, library based drop-in sessions for teens and families, and an after-school program for Deaf students.

The learning objectives of this workshop are:

- **Technical Knowledge:** Participants will learn the basics of electrical circuits and how to design/build them.
- **Pedagogical Discussion:** The effectiveness of using artistic projects to introduce circuits to children will be discussed. Particular emphasis will be given to the role e-textiles and creative circuitry can play in engaging students who are not typically well represented in STEM programs.
- **Implementation:** Participants will brainstorm and discuss ways to incorporate creative circuitry into their own educational settings.

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The session will begin with an explanation of a variety of Creative Circuitry projects, and an overview of the research literature on this topic, particularly as it applies to K-12 student learning. The hands-on component of the workshop will be focused on building Squishy Circuits. Through this activity we will discuss open and closed circuits, the differences between conductors and insulators, and basic circuit components (such as LEDs, resistors, and motors). The explanation will include both the technical terminology as well as some analogies that our research group has found useful when explaining the circuits to younger children. There will then be a short demonstration of how these components work with the dough.

Participants will be encouraged to play with the conductive and insulating dough to make a variety of circuits that use LEDs, buzzers, and motors. The workshop leaders will spend time with the participants answering questions, problem solving, and discussing common struggles their students might have.

The participants will be given the recipes for the conductive and insulating dough, instructive notes that explain short circuits, conductors and insulators, LEDs, and open and closed circuits, and the link to the Squishy Circuit site to help further the exploration of these components. Additionally, participants will receive handouts with additional Creative Circuitry project ideas and strategies for reducing supply costs.

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Authentic Engineering Connection. Identify and describe how you will explicitly address the ways in which your lesson or activity is representative of the processes, habits of mind and practices used by engineers, or is demonstrative of work in specific engineering fields.¹ At least one of those must be within the first four listed, below; i.e., do not only check “other”. Check all that apply:

- Use of an engineering design process that has at least one iteration/improvement
- Attention to specific engineering habits of mind
- Attention to engineering practices (as described in the NGSS/Framework and as practiced by engineers)
- Attention to specific engineering careers or fields related to the lesson/activity
- Other (please describe below)

Engineering Habits of Mind: Attention will be paid to engineering habits of mind, particularly creativity, collaboration, and communication. When building Squishy Circuits participants will be working in small groups, or pairs, which necessitates a discussion of the project and how to build it together. By introducing a variety of colors for both components and dough, participants are encouraged to think creatively about their desired design.

NGSS/Framework: Creative circuitry projects require students to plan electrical circuits such that they are both functional and adhere to the aesthetic that the designer is aiming for.

Attention to Specific Engineering Careers or Fields: This workshop is focused on Electrical Engineering concepts and applications.

Diversity.

The presenters will discuss strategies for incorporating Squishy Circuits and e-textiles into curriculum for various age and ability levels. Squishy Circuits and e-textiles have been used with PK-elementary classrooms, summer workshops for girls, library based drop-in sessions for teens and families, and an after-school program for Deaf students.

The workshop will also highlight the cost effectiveness of the Creative Circuit activities. Squishy Circuit dough is made of household items and the components are fairly accessible. E-textile projects, excluding the conductive thread, have many cheap components and recycling fabrics is encouraged. A list of components and product availability will be given to participants.

Research showing the positive effect of e-textiles to inspire women to become engineers and to explore science and engineering will be discussed. There will also be a focus on the maker movement and how it encourages engineering for all ages.

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Are there any online components to the proposal or presentation? (Note that these online components may only be available to presenters or those who have their wireless subscriptions, since wireless may not be available during the workshop sessions.)

MAYBE

Please describe:

If possible, we would love to use web resources, but can do the workshop without them.

Grade Level Target Audience (check all that apply):

- X Primary (EC–2)
- x Elementary (3–5)
- x Middle School (6-8)
- x High School (9-12)

Maximum Number of Participants:
25

All Seating is Classroom (tables and chairs).

Audio Visual Equipment Requests:

Note: An LCD projector, screen and podium with attached microphone are provided. Requests for additional equipment or resources (e.g., internet connection or laptops) will incur extra charges. If you do not have additional requests, please indicate with “Not applicable.”

Internet access

Reminder:

Presenters must register and pay the registration fee to support their workshop attendance and audio/video costs.

Thank you for completing this proposal form!

Please review this document prior to submitting it to ensure that all items are complete.

ASEE USE ONLY

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Date Received:

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Proposal ID Number: